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In re Application of: Porter and Roberts **Confirmation No. 9831**

Serial No.: 10/615,671 **Group Art Unit: 1771**

Filed: July 9, 2003 **Examiner: Pierce, Jeremy R.**

For: Fabric Reinforcement And Cementitious Boards Faced With Same

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By Mary LaGrange

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REPLY BRIEF

Pursuant to 37 C.F.R. § 41.41, Appellants hereby submit this reply brief. The reply brief is being timely submitted under 37 C.F.R. § 41.41(a)(1), the date of the Examiner's Answer being January 11, 2006. The reply brief is being submitted in triplicate.

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I. Real Party in Interest

The real party in interest is Saint-Gobain Technical Fabrics, present owner of the application and the invention described therein.

II. Related Appeals and Interferences

There are no related appeals or interferences.

III. Status of Claims

The status of the claims has not been changed since Appellants' opening Appeal Brief.

IV. Grounds of Rejection to be Reviewed on Appeal

The grounds for rejection as stated in Appellants' opening Appeal Brief have not been changed, except that the rejection of claims 1-9 and 25-29 under 35 USC §112, first paragraph, has been withdrawn by the Examiner in his Answer. No new grounds for rejection have been made.

V. Argument

A. Introduction

Claims 1-9 and 22-29 are pending in this Appeal. Of these claims, only claims 1, 22, 25 and 26 are independent. While the Appellants are grateful for the Examiner's withdrawal of his rejection of claims 1-9 and 25-29 under the first paragraph of §112, claims 1-5, 7, 9, 22 and 25-29 remain rejected under 35 USC §102(b) as being anticipated by U.S. Pat. No. 4,460,633 to Kobayashi et al. et al. (hereinafter "Kobayashi et al."), or in the alternative, under 35 USC

§103(a) as being obvious over Kobayashi et al.. In addition, dependent claim 23, which is drawn to a cement board containing the fabric reinforcement of claim 22, is subject to rejection under 35 USC §103(a) as being unpatentable over Kobayashi et al. in view of U.S. Pat. No. 4,581,275 to Endo et al. et al. (hereinafter "Endo et al."); and claims 6, 8, and 24 are rejected under §103(a) as being unpatentable over Kobayashi et al. in view of Endo et al., and further in view of U.S. Pat. No. 5,038,555 to Wu et al. et al. (hereinafter "Wu et al.").

The present invention relates to a resin-coated fabric useful in reinforcing a matrix, such as a resinous or cementitious matrix. Each of the claims also uses the term "coating weight distribution ratio" or "WPU_{cd}/WPU_{md}" (independent claims 1, 25 and 26), or claims that the weft yarns absorb less of the resinous coating than the weft yarns would absorb if they were twisted as much as the warp yarns (claim 22). Claim 23, even though it is a dependent claim, depending from claim 22, is directed to a cementitious board incorporating the multifilament yarn-based woven, braided, nonwoven mesh-type or knitted fabric of claim 22.

Since there appears to be an honest misinterpretation of the some of the terms of the rejected claims, Appellants would like to address how the misinterpreted terms should be defined in view of Appellants' specification.

First, the Examiner has read Appellants' resinous coating disposed on its warp and weft yarns limitation ((c) of Appellant's independent claims) as being broad enough to encompass something that is rolled or painted on a yarn which has already been impregnated with an adhesive. This interpretation of the term "coating" is made without reference to the additional

terms that are found in each paragraph (c) of each independent claim, in order to delimit what Appellants' intended to be the metes and bounds of their "resinous coating."[1]

---

1. For example:

Claim 1. A fabric reinforcement useful in reinforcing an alkaline matrix comprising...

(c) a resinous coating disposed over a substantial portion of said warp and weft yarns after they have been assembled or laid together, such as to produce a coating weight distribution ratio (WPU_{cd}/WPU_{md}) of less than about 2.0:1, before said fabric reinforcement is embedded within, or adhesively or mechanically bonded to said alkaline matrix.

Claim 22. A multifilament yarn-based woven, braided, nonwoven mesh-type, or knitted fabric comprising...

(c) a resinous coating applied to said plurality of warp and said plurality of weft yarns while the warp yarns are being pulled in tension in a machine direction, such that the weft yarns absorb less of said resinous coating than said weft yarns would absorb if the second twist of said weft yarns was equal to the first twist of said warp yarns.

Claim 25. A multifilament yarn-based woven, braided, nonwoven mesh-type, or knitted fabric suitable for subsequent use as a matrix reinforcement comprising...

(c) a protective resinous coating applied to said plurality of warp and weft yarns after they have been assembled or laid together, such as to produce a weight distribution ratio (WPU_{cd}/WPU_{md}) of less than about 2.0:1 before said reinforcement is applied to a matrix, said weight distribution ratio created in substantial part by the difference in twists of said warp and weft yarns.

Claim 26. A multifilament yarn-based woven, braided, non-woven mesh-type, or knitted fabric suitable for subsequent use as a matrix comprising...

(c) a resinous coating applied to said plurality of warp yarns and said plurality of weft yarns after they have been assembled or laid together, such as to produce a coating weight distribution ratio (WPU_{cd}/WPU_{md}) of less than about 2.0:1 before said fabric is embedded within, or adhesively or mechanically attached to a matrix.

As such, "the wet pick-up or WPU of a strand or yarn is defined as the weight of liquid coating on a yarn or strand divided by the weight of the strand or yarn, expressed as a percentage. The WPU of a strand in a dipping or roll coating process is determined in part by the following relationship:

$$WPU_{actual} = WPU_{max} - K \text{ x tension x twist frequency"}$$

(Specification at ¶ [0008]).

The Examiner's error is a simple one and is clearly reflected in his statement:

> Looking at Figure 2 of Kobayashi et al. et al., given the breadth of the warp fibers (2) compared to the weft fibers (1), it would only seem natural that the resin pick-up on the warp fibers would be at least ½ that of the weft fibers.

(Examiner's Answer at 10.)

The Examiner apparently believes that the coating weight distribution ratio, $WPU_{actual} = WPU_{max}$, is based on the "gross weight" of the coating and not the "normalized ratio" of the coatings, or WPU_{cd}/WPU_{md} = (weight of liquid coating on weft / weight of weft yarn(s)) ÷ (weight of liquid coating on warp/weight of warp yarn(s)). **Since the liquid coating weight is normalized by the weight of the weft or warp yarns coated, the "breadth" of the warp fibers being greater than the "breadth" of the weft fibers does not translate into a lower coating weight distribution ratio.**

Further, the resinous coating of each of these claims has been characterized as producing a specific coating weight distribution ratio understood by those of ordinary skill in the art to include "absorption", "permeation," or "soaking" of the weft and warp yarns. The ability of a yarn to ***soak*** or ***absorb*** liquid resin is a necessary property inherently referenced by Applicants' definition of WPU in the specification (see, e.g., Specification ¶¶ [0008], [0009] & [0064]) and,

consequently, the coating weight distribution ratio WPU_{cd}/WPU_{md} limitation in the claims. More specifically, the ability of the yarn to soak or absorb liquid resin increases its WPU directly, and is the primary factor, not yarn breadth, as posited by the Examiner, in determining WPU and the coating weight distribution ratio. (See Specification ¶¶ [0008], [0009], [0010], [0011], [0014], [0016], [0066] & FIG. 7 (clearly showing that the yarns "absorb" the resinous coating).) In fact, absorption of resin by the yarns is essential to the purpose of this invention, since:

> Unequal coating levels between the MD and CD yarns, normally found in dip coated fabrics, an "imbalance coating weight distribution ratio", often leads to undesirable properties of reinforcements, especially those which have been treated or coated for corrosion or fire resistance. In corrosive environments, such as cement-based matrices, heavier coating in the CD implies lower, possibly inadequate coating protection on the MD. Both quantity and quality of coating in the MD suffers. The tensioned, twisted MD bundle ***does not allow coating to penetrate within the bundle***. As a result, substantial pockets of air remain in the MD bundle. The poor quantity and quality of coating on the MD strands leads to poor corrosion protection of said strands relative to that of the CD strands.

(Specification ¶ [0011] (emphasis added).)

The solution to this serious problem in the cement board arts is proposed by Appellants in the Summary of the Invention at paragraph [0014]:

> Ideally, the tension and/or twist in the machine or warp direction is lowered, and the tension or twist in the cross-machine or weft direction is increased, ***to increase coating absorption in the warp yarns while reducing or maintaining the coating absorption in the weft yarns.***

(Specification ¶ [0011] (emphasis added).)

The limitations of each paragraph (c) of Appellants' independent claims 1, 22, 25 and 26, alleged to be purely functional by the Examiner, help to define what Appellants meant by

"coating weight distribution ratio" (claims 1, 25 and 26), and the degree of "absorption by the weft yarns" (claim 22). Given that Appellants clearly reference the absorption of resin by the weft and warp yarns in their definition of WPU and, therefore, in the coating weight distribution ratio limitation in claims 1, 25 and 26, and, more expressly, the "absorption" of the yarns in claim 22, the Examiner's statement that "Appellant's claims do not require the resin to impregnate the weft fibers," (Examiner's Answer at 8), is erroneous and demonstrates what Appellants' believe to be a clear misunderstanding of a fundamental feature of the claimed invention. The weight of liquid coating absorbed by the weft and warp yarns, or WPU, is directly related to the twist and tension applied to these yarns as they are coated. It is this principle that Appellants have discovered and, despite contrary teachings in the prior art, implemented in the claimed invention to solve some of the problems Appellants endeavored to address, i.e., uneven coating of warp and weft yarns and the effect of such on the long-term integrity of a fabric reinforcement in a matrix, such as cement. A proper understanding of these terms is essential in describing when the intermediate article of these claims is identified and its properties are measured, so that one of ordinary skill in the art can recognize and replicate same.

In view of the claims as read in their entirety, along with the explanations for Appellants' defined terms "coating weight distribution ratio" and "WPU_{cd}/WPU_{md}", it is clear that all of Appellants' claims require:

1. a wet pick-up by the cross-machine direction, or "weft" yarns (WPU_{cd}) to be less than normal, i.e., less than about 2.0 times that of the warp yarns wet pick-up (WPU_{md}); and

2. except for claim 23, which is drawn to a cement board, all of the claims require a fabric as an intermediate article in the process of making a composite, and require the coating

weight distribution ratio of this fabric to be determined, for purposes of patentability, prior to being contained within a matrix (e.g., resin or cement).

In view of Appellants' context and definitions, and further in view of the following argument, reconsideration of the Examiner's §102/103 rejection in view of Kobayashi et al. is requested, since there in no disclosure in this reference of any matrix resin being absorbed or picked up by the weft yarns to achieve a more balanced coating weight distribution ratio, nor does this reference disclose pre-coating warp yarns prior to contact with a matrix material. **In fact, Kobayashi et al. expressly teaches against both.**

In addition, reconsideration of the rejection of Appellants' claims under §103 over Kobayashi et al. in view of Endo et al. is respectfully requested since it is believed that there is no *prima facie* case for this combination, that both references teach away from Appellants' invention, and that both references teach a healthy skepticism of Appellants' solution.

Finally, reconsideration of the Examiner's rejection of claims 6, 8 and 24, under §103(a) is respectfully requested since the addition of Wu et al. to the disclosures of Kobayashi et al. and Endo et al. fails to overcome the apparent deficiencies of these references in anticipating or rendering Appellants' claims obvious, and with respect to claim 8, fails to provide a teaching or suggestion for either a "hydrophilic" (water loving) or "oleophilic" (oil loving) agent.

B. The claims rejected by the Examiner are patentable over the cited references.

Independent claims 1, 25 and 26 all include a "coating weight distribution ratio," defined by the formula WPU_{cd}/WPU_{md}, of less than 2.0:1. Claim 22 requires that the weft yarns "absorb less of the resinous coating than the weft yarns would absorb if the second twist of the weft yarns was equal to the first twist of the warp yarns." All of these claims require a plurality of warp yarns having a first twist and a plurality of weft yarns having a second twist, the second twist being greater than the first twist. All of these claims are directed to fabrics which have been defined by Appellants' specification to be "flexible." (Specification ¶ [0030].) Such fabric reinforcements are designed to be used in matrices for providing reinforcement. Appellants use the commercial embodiment of their reinforcement fabric in cement boards. Cement is highly corrosive to many fibers, such as glass, and requires a protective coating of a resin in order to avoid deterioration in the alkaline cement environment. Appellants have determined that most fabrics made on automated machinery, weavers, etc., include a tension in the machine direction warp yarns that is typically greater that the tension in the cross-machine weft yarns of the fabric.

A yarn under tension, typically, absorbs less resinous coating than a yarn under less tension. So, typically, the wet pick-up in the machine direction (WPU_{md}), is much less than the wet pick-up in the cross-machine direction (WPU_{cd}). (See Specification ¶ [0065].) Thus, the ratio WPU_{cd}/WPU_{md} typically reflects an imbalance between the resin that is absorbed in the relatively taut warp yarns, and the resin that is absorbed in the weft yarns. Typically, this asymmetry is about 2.5:1 WPU_{cd}/WPU_{md}. (Specification ¶ [0064].)

Appellants were the ones to invent a process and resulting intermediate article of manufacture, in which employing a greater degree of twist in the weft yarns and a lesser degree

of twist in the warp yarns, brings about better uniformity of coatings. (Specification ¶ [0066].)

As stated in the Specification at paragraph [0066]:

> In the most preferred embodiments, the twist, hydrophilicity and/or tension are adjusted so that more coating is absorbed into the warp yarns 106 while maintaining or even reducing the amount of coating absorbed into the weft yarns 102. In the most preferred embodiments of this invention, the coating weight distribution ratio is less than about 2.0:1, and preferably, is less than about 1.5:1, with an ideal ratio being about 1:1, for example, if all twist is removed from the warp yarns 106.

Accordingly, all of Appellants' independent claims require that both the warp and weft yarns ***absorb*** coating, but that the twist of the weft yarns is greater than the twist of the warp yarns, so that coating is preferentially absorbed into the warp yarns more so than it would ordinarily be absorbed.

The Examiner's position treats the term "resinous coating" literally, but out of context. Each of Appellants' independent claims characterizes the resinous coating as producing a "coating weight distribution ratio" of less than 2.0:1 (claims 1, 25 and 26), or define the resinous coating such that the weft yarns "absorb less of the resinous coating" than they would ordinarily absorb if they had the same twist as the warp yarns (claim 22). Consequently, each independent claim requires that the resinous coating be absorbed by ***both*** the warp and weft yarns, which, contrary to the Examiner's assertions, ***do*** "distinguish the claimed 'resinous coating' from the resin used in Kobayashi et al.," as well as in Endo et al.. (Examiner's Answer at 7.) This context must be considered in order to adequately interpret Appellants' claims, and neither Kobayashi et al. nor Endo et al. teach or suggest these limitations.

1. Appellants' claims are not anticipated by or obvious over Kobayashi et al.

Kobayashi et al. is directed to a nonwoven reinforcement for resinous composites which includes warps consisting of non-twist or soft twist yarns on one or both sides of wefts of non-twist or soft twist yarns. Adhesive agent is impregnated into the wefts such that there is enough excess adhesive to also bind the warp and weft yarns together. (Col. 2, lines 5-12 and 32-38; col. 3, lines 10-18.)

There is no disclosure of a matrix resin being absorbed or "picked-up" by the weft yarns of Kobayashi et al. The absence of such a disclosure is no accident, since Kobayashi et al. impregnate their wefts with adhesive to the point of saturation, such that there is enough excess adhesive to bind the warp and weft yarns together. (See id. at col. 3, lines 10-18.) If the weft yarns of Kobayashi et al. are thus so saturated with adhesive, there can be no space or volume remaining for absorbing a matrix resin. Since Kobayashi et al. fail to disclose a matrix resin being absorbed into the weft yarn, as required by all of Appellants' claims, it can not support an obviousness or anticipation rejection.

The Examiner's position with regard to Kobayashi et al. is:

> The Examiner made it clear that it was the matrix resin applied to the fabric after it has been treated with adhesive agent, and not the adhesive agent itself, that would comprise Appellants' claimed resinous coating.

(Examiner's Answer at 7, line 13.) However, if it is the matrix resin of Kobayashi et al. that the Examiner is relying upon to demonstrate a resinous coating applied such as to provide Appellants' "coating weight distribution ratio," or relative absorption of resin into the weft yarns, compared to the warp yarns, then Kobayashi et al. can neither anticipate nor render obvious Appellants' invention, since Kobayashi et al.'s already saturated weft yarns are not disclosed as

absorbing any matrix resin at all, and logically, would be prohibited from doing so, since they can not absorb matrix resin if they are already saturated with adhesive.

Appellants assert that this is another fundamental misunderstanding upon which the Examiner's improper rejection is based. Although the Examiner has made it clear that he is relying upon the matrix resin of Kobayashi et al. to provide Appellants' resinous coating, the Examiner does not identify a feature in Appellants' invention that is analogous to the adhesive agent in Kobayashi et al. By selectively ignoring that Kobayashi et al. teach an adhesive agent impregnating the wefts such that, logically, the matrix resin can not impregnate or be absorbed by the wefts, the Examiner effectively reads Appellants' coating weight distribution ratio limitation out of claims 1, 25 and 26, and Appellants' limitation that the weft yarns "absorb less of the resinous coating than the weft yarns would absorb if the second twist of the weft yarns was equal to the first twist of the warp yarns" out of claim 22. Particularly with regard to the coating weight distribution ratio, as Appellants' have defined the ratio with respect to wet pick up of wefts and warps of a single resinous coating, this limitation makes no sense in the context of a reinforcement like the one disclosed in Kobayashi et al. where the weft is saturated with a first material (e.g., an adhesive agent) and the warp is impregnated with a second, different material (e.g., a resin matrix).

Additionally, if we continue following the Examiner's logic that the matrix resin is the resinous coating applied to the warp and weft yarns found in paragraph (c) of Appellants' independent claims, how would Kobayashi et al. be useful as a matrix reinforcement, as set forth in independent claims 1, 25 and 26? Where is this suggestion or teaching provided in Kobayashi et al.? The nonwoven fabric of Kobayashi et al. is subject to a hand lay-up operation in which

multiple sheets of the reinforcement are laid-up in the same direction as the warp fibers, held at room temperature for one hour, and post-cured at 80°C for two hours to form ***a laminated composite board of 2 mm thickness***. (Kobayashi et al., col. 4, Example 1 (emphasis added) (Example 1 is exemplary of the remaining examples)). Neither Kobayashi et al. nor the Examiner ever explain how this cured laminated composite board of 2 mm thickness could possibly be used as a reinforcement in a subsequent matrix, such as Appellants' cement boards. Laminated composite boards are stiff, can not be readily embedded with a matrix material, and would leave an obvious line of demarcation and weakness in a cement board cross-section. Even if we assume the Kobayashi et al. resin-coated fabric is left uncured, how could it be used as a matrix reinforcement in an uncured state?

Appellants' claims rely on a relative difference in the degree of twist between the warp and weft yarns to directionally absorb a resinous coating into the fabric reinforcement to render it more balanced (e.g., less than 2.0:1, rather than 2.5:1) prior to using the coated fabric in possibly caustic matrix applications. If Kobayashi et al. were concerned about the effect of twist on coating absorption, or the effect of balance in the corrosion resistance of yarns used in reinforcing applications, why would it teach away from pre-coating the warp yarns before introducing the matrix resin (see id. at col. 1, lines 44-51; col. 1, line 67 – col. 2, line 2), or suggest using non-twist or soft twist yarns for both the warp and weft, without a preference of using a higher twist in the weft (id. at col. 2, lines 5-12)?[2]

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2 It is interesting to note that Kobayashi et al. et al. show examples with weft twists higher than warp twists, but that the best example (Table 1: flexural modulus 10,140 kg/mm^2) was No. 3, in which the weft twist was 0 twists/m and the warp twist was 15 twists/m, suggesting to artisans that the opposite was true, i.e., that twisting the warps more than the wefts made for a stronger

Kobayashi et al. et al. make it clear that the problem to be solved by their invention is that adhesive agents applied to the warp yarns "prevent a matrix resin to permeate into the filaments if they are used as a reinforcement." (Id. at col. 1, lines 44-51.) If warp yarns absorb coatings, such as adhesive agents, prior to use in a matrix, "the non-woven fablics [*sic*] disclosed in the above literatures are not suitable for the application as reinforcement for resinous composite." (Id. at col. 1, lines 48-51.) Kobayashi et al. et al clearly state that pre-coating the warp yarns prior to introduction of the matrix ***prevents the matrix from permeating into the filaments*** and ***renders the fabric not suitable*** for application as a reinforcement for resinous composites. (Id.) This reference further adds that "the application of adhesive agent to warps, i.e., reinforcing fibers, inhibits impregnation of matrix resin into the reinforcement to frequently cause the generation of voids which deteriorate reinforcing effect." (Id. at col. 1, line 67- col. 2, line 2.) While the Examiner is correct that the word "inhibits" does not mean to "prevent," it certainly does not provide a clear teaching for balancing the absorption of wet pick-up on the weft and warp yarns. In the context of the statements of prevention and unsuitability of prior coatings, Kobayashi et al. fails to teach or suggest using twist differences to direct pre-coating a fabric before use in a matrix to bring about less wet pick-up in the weft yarns and greater overall corrosion resistance. There can be no clearer teaching away or skepticism of Appellants' invention than the warnings provided by Kobayashi et al.. While it may be alright to impregnate the wefts with adhesive to bind them to the warp yarns, it is not acceptable to Kobayashi et al. et

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composite. Such a teaching would discourage artisans from twisting the weft yarns more, and provide skepticism of Appellants' solution.

al. to impregnate the warp yarns prior to contact with a matrix resin, since it would make the fabric reinforcement *not suitable* for uses as a reinforcement. (Id. at col. 1, lines 48-51.)

Appellants' fabrics require coating to be absorbed by both the warp and weft yarns prior to contact with a matrix. Claim 22 expressly requires that the weft yarns *absorb* resin, which is not suggested or taught by Kobayashi et al. et al., if the matrix resin is relied upon as the Examiner makes "clear". Independent claims 1, 25 and 26, expressly provide for a coating weight distribution ratio (WPU_{cd}/WPU_{md}) of less than 2.0:1, before the reinforcement is applied to a matrix, or before the fabric is embedded within, or adhesively or mechanically attached to a matrix. As stated earlier, such a limitation would be known to one of ordinary skill in the art when reading Appellants' specification as meaning both the warp and weft yarns absorb a resinous coating prior to contact with a matrix, which is something Kobayashi et al. et al. clearly warn artisans against.[3]

2. Appellants' claims are not obvious over Kobayashi et al. et al. in view of Endo et al.

The Federal Circuit has noted, as a "useful general rule," that references that teach away can not serve to create a *prima facie* case of obviousness. *McGinley v. Franklin Sports, Inc.*, 262

3 The fact that the weight distribution ratio as defined by Appellants requires absorption, and not just a coating that sits on the outside of the yarns, is also made clear by the fact that Appellants require a relative twist to create more directional coating. The purpose of increasing the twist in the weft yarns is to compensate for the tension in the warp yarns, so that the coating absorbed into the yarns is more balanced. If the coating merely sat on top of the yarns, rather than being impregnated or absorbed within the yarns, the difference in tension, or twist, would have no bearing. WPU_{cd}/WPU_{md} is a ratio of ratios. In order to lower WPU_{cd}/WPU_{md}, one must coax more resin into the warp or machine direction yarns, or less into the weft. Appellants do this by increasing the twist in the weft or cross-machine direction yarns which makes the wefts absorb less liquid resin and, thus, providing more balance. (Specification ¶¶ [0011], [0016] & [0066]; Claims 1, 22, 25 & 26.)

F.3d 1339, 1354, 60 USPQ 2d 1001(Fed. Cir. 2001); *In Re Gurley*, 27 F.3d 551, 553, 31 USPQ 2d 1130 (Fed. Cir. 1994). A *prima facie* case of obviousness can be rebutted if the Appellant can show that "the art in any material respect taught away" from the claimed invention. *In re Huruna*, 249 F. 3d 1327, 1335, 58 USPQ 2d 1517 (Fed. Cir. 2001). A reference may be said to teach away when a person of ordinary skill upon reading the reference would be led to a direction divergent from the path that was taken by the Appellant. *In Re Geisler*, 116 F.3d 1465, 1469, 43 USPQ 2d 1362, 1365 (Fed. Cir. 1997) (quoting *In Re Malagari*, 449 F.2d 1297, 1303, 182 USPQ 549, 553 (CCPA 1974)).

The Examiner maintains that Endo et al. teach that it is well known in the prior art to use resin impregnated fabrics to reinforce cement (col. 1, lines 5-55). As stated in the Examiner's Answer, "While Endo et al. may teach using a reinforcing fabric that does not contain resin, this does not take away from the fact that using resin impregnated fabrics in cementitious composites is well known." (Examiner's Answer at 11.) The Examiner further maintains that none of Appellants' claims contains recitations pertaining to cement penetrating into fabrics, and that Appellants' recitation of a "cementitious board" only occurs in the preamble of claim 23, but there is no substantive limitation as to the composition, position, or structure of cement, suggesting that Appellants' preamble can be ignored for patentability purposes. (Id.)

It is rather settled law that statements in the preamble may not be disregarded in determining patentability. *In Re Duva*, 156 USPQ 90 (CCPA 1967). Thus, descriptive preambles can be quite helpful in obtaining patentable subject matter. Nevertheless, the scope of claim 23 requires a cementitious board, incorporating a multifilament yarn-based woven, braided, nonwoven mesh-type or knitted fabric having warp and weft yarns in which a resinous

coating is applied to the warp and weft yarns while the warp yarns are being pulled in tension in a machine direction, such that the weft yarns absorb less of the resinous coating than the weft yarns would absorb if the twist of the weft yarns was equal to the twist or the warp yarns. Stated simply, this claim requires a cementitious matrix reinforced with a fabric which has a resinous coating applied to it, such that there is more balance or less relative absorption in the weft yarns than would normally be expected due to the tension in the warp yarns. Consistent with the intended purpose of Appellants' invention, this would result in a cementitious board which has a longer lasting fabric reinforcement, ultimately resulting in a longer service life.

Endo et al. teach a base cloth for reinforcement which comprises a warp and a weft, each comprising a set of parallel yarns running in the machine and cross-machine direction, including a thermoplastic, weldable yarn. (Col. 8, lines 8-18, and claim 1.) The Examiner cites the Background section of Endo et al. (col. 1, lines 1-55) for the premise that "it is well known in the prior art to use resin impregnated fabrics to reinforce cement." (Examiner's Answer at 11.) However, the Background section of Endo et al. does not support the Examiner's conclusion. The relevant disclosure is believed to be:

> A base cloth for reinforcement is sometimes used for composite molded products such as FRP (fiber-reinforced plastic), cement, concrete, tarpaulin, etc. For example, for tennis rackets, fishing rods, etc., base cloths made of a high-strength, and high-modulus multi-filament of carbon fiber, glass fiber, aromatic polyamide fiber or the like are used in a form bound with matrix resins such as epoxy resins, etc. ***Also, for the reinforcement of cement and concrete, alkaline-resist vinylon fibers, etc. are sometimes used as a reinforcing base cloth.*** Further, for the so-called tarpaulin produced by placing a reinforcing material between two layers of paper or film, a base cloth is sometimes used as the reinforcing material.

> The so far known base cloths for reinforcement include for example the following: Woven fabric of reinforcing fibers; products comprising a warp impregnated with small amounts of an adhesive to prevent fraying and a weft which is a thermally weldable fiber, both yarns being adhered to each other at the intersections thereof; products obtained by adhering a warp to a weft impregnated with an adhesive, and the like....
>
> In the method to impregnate the warp with adhesives, ***penetration of matrix resin into base cloth is disturbed by the influence of the impregnating adhesive to cause a poor reinforcement strength.*** Also, since thermally weldable fibers are used as a weft, strength in the widthwise direction can hardly be expected.
>
> The method to impregnate the weft with adhesives is much superior in improving the defect of the foregoing method. But, ***because of the weft being impregnated with adhesives, adhesion of the weft to matrix resins is poor and the reinforcement in the weft direction is not sufficient.***

(Endo et al. at col. 1, lines 5-55 (emphasis added).)

Contradictory to the Examiner's position, Endo et al. do not suggest the use of resin impregnated fibers to reinforce cement. It suggests alkaline resistant vinylon fibers. (Id. at col. 1, lines 12-14.) It also teaches at col. 2, lines 52-54, that "for base cloths for reinforcing cement, concrete, etc., it is preferred to use alkaline-resistant vinylon and aromatic polyamide fiber, etc." Vinylon and aromatic polyamide are synthetic resins themselves, and are not inherently coated fibers. Endo et al. does not suggest coating such plastic fibers prior to use in cement or concrete. While Endo et al. suggests a warp impregnated with a small amount of adhesive to prevent fraying and products obtained by adhering a warp to a weft impregnated with an adhesive (id. at col. 1, lines 20-26), there is no suggestion of using such yarns impregnated with adhesive in a cement or concrete matrix, as suggested by the Examiner.

Moreover, similar to Kobayashi et al., Endo et al. shun resin impregnated fabrics, stating: "in the method to impregnate the warp with adhesives, penetration of matrix resin into the base

cloth is disturbed by the influence of the impregnating adhesive to cause a poor reinforcement strength" and "because of the weft being impregnated with adhesives, adhesion of the weft to matrix resins is poor and the reinforcement in the weft direction is not sufficient." While Endo et al. appear to suggest that some matrix resin may leak into the wefts, one of ordinary skill in the art, upon reading the Endo et al. reference would not be lead in the direction of Appellants' invention. Endo et al. certainly do not suggest the use of coated fabrics for use in cement and concrete matrix applications, but rather, discloses alkaline-resistant plastic fibers, and generally shuns impregnating either the warp or weft yarns prior to contact with a matrix, in favor of using a weldable yarn on either one of the warp or weft yarns for thermally welding the yarns together. (Id. at col. 1, line 60 - col. 2, line 6.)

Taken as a whole, the Endo et al. reference is remarkably consistent with the Kobayashi et al. reference in its warnings against impregnating warp or weft yarns with resinous materials, such as adhesive agents, prior to the introduction of matrix resins. Kobayashi et al. conclude that such a pre-coating technique is "***not suitable*** for the application as reinforcement for resinous composite" (emphasis added, Kobayashi et al. at col. 1, lines 49-51), and Endo et al. conclude that such techniques result in a reinforcement which "***is not sufficient***" (emphasis added, Endo et al. at col. 1, lines 53-55). Appellants not only pre-coat their fabric yarns prior to introducing their matrix resin, but attempt to encourage more absorption of the warp, the so called "reinforcement" yarns, while attempting to keep a more balanced coating on both the warp and waft yarns of their fabric.

Neither Kobayashi et al. nor Endo et al. alone, or in combination, would suggest using a little less twist in the warp yarns in order to encourage more resin absorption into the warp yarns,

prior to introducing the reinforcing fabric into a matrix composition. While Endo et al. recognize the need for alkaline resistance in the reinforcement fabric used in caustic cement and concrete matrices, its solution is to use a polymer fiber, and not to impregnate either the weft or warp yarns with a material that would lead to *poor adhesion to the matrix*. While Endo et al.'s solution of using solid plastic fibers may have merit, it certainly does not teach or suggest Appellants' claimed solution of more balanced pre-coated fibers.

3. Appellants' claims are not obvious over Kobayashi et al. in view of Endo et al. in further view of Wu et al.

Finally, Wu et al. is cited in the Examiner's rejection of claims 6, 8 and 24, for disclosing the use of plastisol coatings on woven fabrics. (Col. 7, line 68 – col. 8, line 2.) Nevertheless, since both Kobayashi et al. and Endo et al. teach against the use of impregnating fibrous yarns prior to contact with matrix materials, they would seem incompatible with Wu et al., which expressly teach coating yarns to make them corrosion resistant in a matrix material.

Furthermore, the Examiner has rejected claim 8 in view of Wu et al., col. 10, lines 11-34, which teaches providing *lubricity* to the glass fibers before applying PVC plastisol coating. Claim 8 requires a *hydrophilic agent* prior to the introduction of a water based coating, or an *oleophilic agent* prior to a polyvinylene-chloride plastisol coating.

In Appellants' response dated February 16, 2005, to the Office Action of November 26, 2004, claim 8 was rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the enablement requirement, since the Examiner believed that the terms "hydrophilic agent" (water loving), "oleophilic agent (oil loving), and "hydrophobic" agent (water-repellent) were not described in the specification in such a way as to enable one skilled in the art to which it pertains

to made or use the invention. At the time, Appellants argued that hydrophilic, hydrophobic and oleophilic agents are discussed generally in connection with subsequent polyvinyl-plastisol or water based coatings in paragraph [0017], which provides verbatim support for the limitations of claim 8. Appellants' continued by specifically enumerating various hydrophilic, hydrophobic and oleophilic agents in paragraph [0088] of the specification.

The American Heritage Dictionary (Houghton Mifflin Co. 1976) defines "lubricity" as ". . . slipperiness from the Latin *lubricus*, slippery". As far as Appellants are aware, a lubricious agent (slippery) is not the same as a hydrophilic agent (water loving) or an oleophilic agent (oil loving), required by claim 8, and does not suggest either. Accordingly, independent of Appellants' arguments with respect to Kobayashi et al. and Endo et al., claim 8 appears to be patentable over the combination of Kobayashi et al., Endo et al. and Wu et al., under §103(a), because the elements of a hydrophilic or oleophilic agent are not taught or disclosed at col. 10, lines 11-34 of Wu et al., relied on by the Examiner for disclosing same.

VI. CONCLUSION

For the reasons stated herein, the Examiner's rejection of claims 1-9 and 22-29 should be considered and reversed by this Board. Appellants submit that this application is in condition for allowance and respectfully request reversal of the rejections set forth in the Examiner's Answer.

Claims Appendix

1. (previously presented) A fabric reinforcement useful in reinforcing an alkaline matrix comprising:

(a) a plurality of warp yarns having a first twist (turns/inch);

(b) a plurality of weft yarns having a second twist which is greater than said first twist; and

(c) a resinous coating disposed over a substantial portion of said warp and weft yarns after they have been assembled or laid together, such as to produce a coating weight distribution ratio (WPU_{cd} / WPU_{md}) of less than about 2.0:1, before said fabric reinforcement is embedded within, or adhesively or mechanically bonded to said alkaline matrix.

2. (original) The fabric of claim 1 wherein said warp yarns comprise a first twist of about 0-.5 turns/inch.

3. (original) The fabric of claim 2 wherein said weft yarns comprise a second twist of about 0.5 – 1.3 turns/inch.

4. (original) The fabric of claim 1 wherein said warp yarns, said weft yarns, or both, comprise glass fibers.

5. (original) The fabric of claim 1 wherein said warp yarn and weft yarns are assembled into one or more of:

a woven fabric, knit fabric, laid scrim fabric, or braided fabric.

6. (previously presented) The fabric of claim 1 wherein said resinous coating comprises a polyvinyl-chloride-based plastisol.

7. (original) The fabric of claim 1 wherein said plurality warp yarns are drawn in tension prior to the application of said resinous coating.

8. (previously presented) The fabric of claim 1 wherein said warp yarns are selected to include, or are treated with, a hydrophilic agent, prior to a water based coating, or an oleophilic agent prior to a polyvinyl-chloride plastisol coating.

9. (previously presented) The fabric of claim 1 wherein said weft yarns are selected to include, or are treated with, an oleophobic agent prior to a pvc-based plastisol coating, or a hydrophobic agent prior to a water based coating.

10. (withdrawn) A reinforced cementitious board comprising:

(a) a cementitious core; and

(b) a reinforcing fabric disposed on at least one face of said cementitious core; said reinforcing fabric including:

(i) a plurality of warp yarns having a first twist (turns/inch);

(ii) a plurality of weft yarns having a second twist which is greater than said first twist; and

(c) a resinous coating applied to said reinforcing fabric in a coating weight distribution ratio of less than about 2.0:1 based upon the weight of the resinous coating on the weft yarns, over the weight of the resin on the warp yarns.

11. (withdrawn) The cementitious board of claim 10 wherein said cementitious core comprises Portland cement.

12. (withdrawn) The cementitious board of claim 10 wherein said reinforcing fabric comprises a woven, braided, nonwoven mesh-type or knitted fabric.

13. (withdrawn) The cementitious board of claim 10 wherein said first twist of said warp yarns is about 0-.3 turns/inch.

14. (withdrawn) The cementitious board of claim 13 wherein said second twist of said weft yarns is about .7-1.0 turns/inch.

15. (withdrawn) The cementitious board of claim 10 wherein said resinous coating comprises an alkali-resistant resin.

16. (withdrawn) A reinforced cementitious board comprising:

(a) a cementitious core comprising Portland cement; and

(b) a reinforcing fabric disposed generally around and embedded into a portion of said cementitious core; said reinforcing fabric being composed of a multifilament yarn-based woven, braided, nonwoven mesh-type, or knitted fabric which includes:

(i) a plurality of warp yarns having a first twist (turns/inch);

(ii) a plurality of weft yarns having a second twist, said second twist being greater than said first twist; and

(c) an alkali resistant resinous coating applied to said plurality of warp and said plurality of weft yarns after they have been assembled or laid together, such as to produce a coating weight distribution ratio of less than about 2.0:1 based upon the weight of the resinous coating on the weft yarns over the weight of the resinous coating on the warp yarns.

17. (withdrawn) The cementitious board of claim 16 wherein said reinforcing fabric comprises sized glass fibers.

18. (withdrawn) The cementitious board of claim 16 wherein said warp yarns have a twist of about 0-.3 turns/inch.

19. (withdrawn) The cementitious board of claim 18 wherein said weft yarns have a twist of about .7-1 turns/inch.

20. (withdrawn) The cementitious board of claim 16 wherein said alkali resistant coating provides alkali resistance to said reinforcing fabric beyond one year in a Portland cement board.

21. (withdrawn) The cementitious board of claim 20 wherein said resinous coating comprises a pvc matrix having an oil phase distributed therein.

22. (original) A multifilament yarn-based woven, braided, nonwoven mesh-type, or knitted fabric comprising:

(a) a plurality of warp yarns having a first twist (turns/inch);

(b) a plurality of weft yarns having a second twist, said second twist being greater than said first twist; and

(c) a resinous coating applied to said plurality of warp and said plurality of weft yarns while the warp yarns are being pulled in tension in a machine direction, such that the weft yarns absorb less of said resinous coating than said weft yarns would absorb if the second twist of said weft yarns was equal to the first twist of said warp yarns.

23. (original) A cementitious board incorporating the multifilament yarn-based woven, braided, non-woven mesh-type or knitted fabric of claim 22.

24. (original) The fabric of claim 22 wherein said resinous coating comprises a alkali resistant resin.

25. (previously presented) A multifilament yarn-based woven, braided, nonwoven mesh-type, or knitted fabric suitable for subsequent use as a matrix reinforcement comprising:

(a) a plurality of warp yarns containing a glass filament having a first twist of about 0-.3 turns/inch.

(b) a plurality of weft yarns containing a glass filament having a second twist of about .7-1.0 turns/inch; and

(c) a protective resinous coating applied to said plurality of warp and weft yarns after they have been assembled or laid together, such as to produce a weight distribution ratio (WPU_{cd} / WPU_{md}) of less than about 2.0:1 before said reinforcement is applied to a matrix, said weight distribution ratio created in substantial part by the difference in twists of said warp and weft yarns.

26. (previously presented) A multifilament yarn-based woven, braided, non-woven mesh-type, or knitted fabric suitable for subsequent use as a matrix comprising:

(a) a plurality of warp yarns having a first twist (turns/inch);

(b) a plurality of weft yarns having a second twist; and

(c) a resinous coating applied to said plurality of warp yarns and said plurality of weft yarns after they have been assembled or laid together, such as to produce a coating weight distribution ratio (WPU_{cd} / WPU_{md}) of less than about 2.0:1 before said fabric is embedded within, or adhesively or mechanically attached to a matrix.

27. (original) The fabric of claim 26 wherein said first twist ratio is less than said second twist ratio.

28. (original) The fabric of claim 26 wherein said weft yarns have a lower hydrophilicity than said warp yarns.

29. (previously presented) The fabric of claim 26 wherein said tension is applied to said weft yarns.

30. (withdrawn) A method of making a coated fabric comprising:

(a) providing a plurality of warp yarns having a first twist (turns/inch);

(b) assembling a plurality of weft yarns with said warp yarns, said weft yarns having a second twist; said second twist being greater than said first twist; and

(c) applying a resinous coating to assembly of said plurality of warp yarns and plurality of weft yarns, whereby the weight of the resinous coating on the weft yarns over the weight of the resinous coating on the warp yarns is less than about 2.0:1.

31. (withdrawn) The method of claim 30 wherein said weft yarns, warp yarns, or both, comprise glass filaments.

32. (withdrawn) The method of claim 30 wherein the weight of the resinous coating on the weft yarns over the weight of the resinous coating on the warp yarns is less than about 1.5:1.

33. (withdrawn) The method of claim 30 wherein said resinous coating comprises a plastisol.

34. (withdrawn) A method of making a cementitious board, comprising:

(a) providing a cementitious slurry;

(b) depositing said cementitious slurry onto a moving reinforcing fabric, said reinforcing fabric comprising a plurality of warp yarns having a first twist (turns/inch), a

plurality of weft yarns having a second twist which is greater than said first twist; and a resinous coating applied to said reinforcing fabric in a coating weight distribution ratio of less than about 2.0:1, based upon the weight of the resinous coating on the weft yarns, over the weight of the resinous coating on the warp yarns;

(c) shaping said cementitious slurry and said reinforcing fabric into a board, whereby said reinforcing fabric is disposed on at least one face thereof, and

(d) permitting said cementitious slurry to set.

35. (withdrawn) The method of claim 34 wherein said forming step is continuous or discontinuous.

TRANSMITTAL FORM

(to be used for all correspondence after initial filing)

Application Number	10/615,671
Filing Date	July 9, 2003
First Named Inventor	John F. Porter
Art Unit	1771
Examiner Name	Pierce, Jeremy R.
Attorney Docket Number	D1815-00068
Total Number of Pages in This Submission	

ENCLOSURES (*Check all that apply*)

- [x] Fee Transmittal Form
  - [ ] Fee Attached
- [ ] Amendment/Reply
  - [ ] After Final
  - [ ] Affidavits/declaration(s)
- [ ] Extension of Time Request
- [ ] Express Abandonment Request
- [ ] Information Disclosure Statement
- [ ] Certified Copy of Priority Document(s)
- [ ] Response to Missing Parts/ Incomplete Application
  - [ ] Response to Missing Parts under 37 CFR 1.52 or 1.53
- [ ] Drawing(s)
- [ ] Licensing-related Papers
- [ ] Petition
- [ ] Petition to Convert to a Provisional Application
- [ ] Power of Attorney, Revocation Change of Correspondence Address
- [ ] Terminal Disclaimer
- [ ] Request for Refund
- [ ] CD, Number of CD(s) ____________
- [ ] After Allowance Communication to Group
- [ ] Appeal Communication to Board of Appeals and Interferences
- [x] Appeal Communication to Group **(Appeal Notice, Brief, Reply Brief)**
- [ ] Proprietary Information
- [ ] Status Letter
- [x] Other Enclosure(s) (please Identify below):

Remarks

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March 1, 2006
Date

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm or Individual	**Peter J. Cronk, Registration No. 32,021** **Duane Morris LLP, 30 South 17th Street, Philadelphia, PA 19103-4196**
Signature	[signature]
Date	March 1, 2006

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Effective on 12/08/2004.
Fees pursuant to the Consolidated Appropriations Act, 2005 (H.R. 4818).

FEE TRANSMITTAL
For FY 2005

☐ Applicant claims small entity status. See 37 CFR 1.27

TOTAL AMOUNT OF PAYMENT	($) 500.00

Complete if Known	
Application Number	10/615,671
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First Named Inventor	John F. Porter
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Art Unit	1771
Attorney Docket No.	D1815-00068

METHOD OF PAYMENT (check all that apply)

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FEE CALCULATION

1. BASIC FILING, SEARCH, AND EXAMINATION FEES

	FILING FEES		SEARCH FEES		EXAMINATION FEES		
Application Type	Fee ($)	Small Entity Fee ($)	Fee ($)	Small Entity Fee ($)	Fee ($)	Small Entity Fee ($)	Fees Paid ($)
Utility	300	150	500	250	200	100	
Design	200	100	100	50	130	65	
Plant	200	100	300	150	160	80	
Reissue	300	150	500	250	600	300	
Provisional	200	100	0	0	0	0	

2. EXCESS CLAIM FEES

Fee Description	Fee ($)	Small Entity Fee ($)
Each claim over 20 or, for Reissues, each claim over 20 and more than in the original patent	50	25
Each independent claim over 3 or, for Reissues, each independent claim more than in the original patent	200	100
Multiple dependent claims	360	180

Total Claims ____ - 20 or HP = **Extra Claims** ____ x **Fee ($)** ____ = **Fee Paid ($)** ____

HP = highest number of total claims paid for, if greater than 20

Multiple Dependent Claims **Fee ($)** ____ **Fee Paid ($)** ____

Indep. Claims ____ - 3 or HP = **Extra Claims** ____ x **Fee ($)** ____ = **Fee Paid ($)** ____

HP = highest number of independent claims paid for, if greater than 3

3. APPLICATION SIZE FEE

If the specification and drawings exceed 100 sheets of paper, the application size fee due is $250 ($125 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).

Total Sheets ____ - 100 = **Extra Sheets** ____ / 50 = **Number of each additional 50 or fraction thereof** ____ (round up to a whole number) x **Fee ($)** ____ = **Fee Paid ($)** ____

4. OTHER FEE(S) **Fees Paid ($)**

Non-English Specification, $130 fee (no small entity discount)

Other: Reply Brief $500.00

SUBMITTED BY

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Name (Print/Type)	Peter J. Cronk		Date Mar 1, 2006